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| 10/657,402 | 09/08/2003 | Shin-ichi Nishi | KOT-0081 | 9916 |

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EXAMINER

MRUK, GEOFFREY S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 05/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/657,402

Applicant(s)

NISHI ET AL.

Examiner

Geoffrey Mruk

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 19-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10 December 2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 19-28 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 6 April 2005.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403).

With respect to claim 1, the primary reference of Ison discloses an inkjet recording head (Fig. 9, element 1100) for ejecting ink in ink channels by deformation of the piezoelectric element (Fig. 9, element 1110), comprising:

- a partition wall (Fig. 9, element 1180), at least a part of which is formed with a piezoelectric element, for partitioning a plurality of tubular ink channels (Fig. 9, element 1130);

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- a top wall (Fig. 9, element 1140) for forming a top surface of the plurality of tubular ink channels by shielding an upper part of the plurality of tubular ink channels;
- a bottom wall (page 13, line 30, i.e. perspective view of part of a printhead) for forming a bottom surface of the plurality of tubular ink channels by shielding the bottom part of the plurality of tubular ink channels;
- wherein, at least a part of the top wall and the bottom wall is made of AlN (page 7, lines 29-36).

Ison fails to disclose at least a part of the top wall and the bottom wall is made of AlN-BN.

The secondary reference of Yokono discloses a “thermoconductive cooling element 3 formed of a composite sintered material consisting essentially of AlN and BN” (Column 5, lines 32-57).

With respect to claim 2, the primary reference of Ison discloses the part of the top wall (Fig. 12, element 1140) and the bottom wall made of AlN is thermally connected to a heat sink (Fig. 12, element 1200).

Therefore, in view of the teachings of the secondary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the AlN-BN material of Yokono for the top and bottom wall. The motivation for doing so would have been to “to reduce the thermal resistance to a great extent as compared with a composite material of AlN” (Column 6, lines 1-5).

2. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 1 and 2 above, and further in view of Fessenden (US 5,895,973).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except the part of the top wall and the bottom wall is adhered to the heat sink via an epoxy type adhesive agent including Ag particles and the layer thickness of the epoxy type adhesive agent is 50 to 70 μm .

Fessenden discloses a "ceramic substrate is preferably 96% alumina and has a thickness of approximately 0.035 inch and is attached to the top of the heat sink 12 by a layer of thermally conductive adhesive 60 having a thickness in the range of approximately 0.002 inch to approximately 0.012 inch" (Column 8, lines 14-23).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the thermally conductive adhesive of Fessenden to adhere the top and bottom wall to the heat sink. The motivation for doing so would have been to dissipate heat (Column 8, lines 9-23).

3. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 1 and 2 above, and further in view of Hara et al. (US 4,296,421).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except that the thickness of the heat sink is 1.0 to 10.0mm.

Hara discloses a "Cu plating of 1mm in thickness is provided as a heat sink 28" (Column 8, lines 27-28).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the heat sink thickness of Hara in the inkjet recording head. The motivation for doing so would have been to "improve the heat release in the heat generating member portion" (Column 8, lines 25-27).

4. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 1 and 2 above, and further in view of Deshpande et al. (US 4,831,390).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except

- the top wall and the bottom wall made of AlN-BN is adhered to the partition wall via an epoxy type adhesive agent including particles of one of aluminum-nitride, alumina and silica;
- a layer thickness of the epoxy type adhesive agent including particles of one of aluminum-nitride, alumina and silica is 5 to 10 μm ;
- the heat sink is provided on a carriage, on which the inkjet recording head is installed; and
- the heat sink is thermally connected to a carriage, on which the inkjet recording head is installed.

Deshpande discloses "It is understood that the epoxy layer 40 is selected for high thermal conductivity and is applied in a thin layer" (Column 4, lines 1-26) and "the cartridge with its resultant R_{CART} acts as an effective heat sink or heat dissipater through convection. The effectiveness can be enhanced by decreasing the resistance. One method is to add particles of a thermally conductive material such as a ceramic (e.g. alumina or aluminum nitride) or metals such as powdered aluminum into the plastic metal used during cartridge formation. Another way is to add a heat sink member directly onto the cartridge surface as shown in FIG. 11. For this embodiment, heat sink 60 is bonded to the surface of cartridge 12" (Column 5, lines 24-35).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the teachings of Deshpande in the inkjet recording head. The motivation for doing so would have been to "augment the value of Q_s creating enhanced heat flow away from the print head and into air" (Column 5, lines 18-20). Also, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the layer thickness of the epoxy type adhesive agent is 5 to 10 μm , since it has been held that it is not inventive to discovering and optimum value or workable ranges by routine experimentation. *In re Aller*, 105 USPQ 233 (CCPA 1955).

5. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403).

With respect to claim 10, the primary reference of Ison discloses an inkjet recording head (Fig. 9, element 1100) for ejecting ink in ink channels by deformation of the piezoelectric element (Fig. 9, element 1110), comprising:

- a partition wall (Fig. 9, element 1180) for partitioning the plurality of tubular ink channels;
- a top wall (Fig. 9, element 1140) for forming a top surface of a plurality of tubular ink channels by shielding an upper part of the plurality of tubular ink channels;
- a bottom wall (page 13, line 30, i.e. perspective view of part of a printhead) for forming a bottom surface of the plurality of tubular ink channels by shielding the bottom part of the plurality of tubular ink channels;
- wherein, at least a part of the top wall and the bottom wall is formed of a piezoelectric element (Fig. 9, element 1110, i.e. boundary between elements 1110 and 1140); and
- at least a part of the top wall and/or the bottom wall is made of AlN (page 7, lines 29-36).

Ison fails to disclose at least a part of the top wall and the bottom wall is made of AlN-BN.

The secondary reference of Yokono discloses a "thermoconductive cooling element 3 formed of a composite sintered material consisting essentially of AlN and BN" (Column 5, lines 32-57).

With respect to claim 11, the primary reference of Ison discloses the part of the top wall (Fig. 12, element 1140) and the bottom wall made of AlN is thermally connected to a heat sink (Fig. 12, element 1200).

Therefore, in view of the teachings of the secondary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the AlN-BN material of Yokono for the top and bottom wall. The motivation for doing so would have been to "to reduce the thermal resistance to a great extent as compared with a composite material of AlN" (Column 6, lines 1-5).

6. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 10 and 11 above, and further in view of Fessenden (US 5,895,973).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except the part of the top wall and the bottom wall is adhered to the heat sink via an epoxy type adhesive agent including Ag particles and the layer thickness of the epoxy type adhesive agent is 50 to 70 μm .

Fessenden discloses a "ceramic substrate is preferably 96% alumina and has a thickness of approximately 0.035 inch and is attached to the top of the heat sink 12 by a layer of thermally conductive adhesive 60 having a thickness in the range of approximately 0.002 inch to approximately 0.012 inch" (Column 8, lines 14-23).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the thermally conductive adhesive of Fessenden to adhere the top and bottom wall to the

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heat sink. The motivation for doing so would have been to dissipate heat (Column 8, lines 9-23).

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 1 and 2 above, and further in view of Hara et al. (US 4,296,421).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except that the thickness of the heat sink is 1.0 to 10.0mm.

Hara discloses a "Cu plating of 1mm in thickness is provided as a heat sink 28" (Column 8, lines 27-28).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the heat sink thickness of Hara in the inkjet recording head. The motivation for doing so would have been to "improve the heat release in the heat generating member portion" (Column 8, lines 25-27).

8. Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 10 and 11 above, and further in view of Deshpande et al. (US 4,831,390).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except

- the top wall and the bottom wall formed of a piezoelectric element, via an epoxy type adhesive agent including particles of one of aluminum-nitride, alumina and silica;

- a layer thickness of the epoxy type adhesive agent including particles of one of aluminum-nitride, alumina and silica is 5 to 10 μm
- the heat sink is provided on a carriage, on which the inkjet recording head is installed; and
- the heat sink is thermally connected to a carriage, on which the inkjet recording head is installed.

Deshpande discloses "It is understood that the epoxy layer 40 is selected for high thermal conductivity and is applied in a thin layer" (Column 4, lines 1-26) and "the cartridge with its resultant R_{CART} acts as an effective heat sink or heat dissipater through convection. The effectiveness can be enhanced by decreasing the resistance. One method is to add particles of a thermally conductive material such as a ceramic (e.g. alumina or aluminum nitride) or metals such as powdered aluminum into the plastic metal used during cartridge formation. Another way is to add a heat sink member directly onto the cartridge surface as shown in FIG. 11. For this embodiment, heat sink 60 is bonded to the surface of cartridge 12" (Column 5, lines 24-35).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the teachings of Deshpande in the inkjet recording head. The motivation for doing so would have been to "augment the value of Q_s creating enhanced heat flow away from the print head and into air" (Column 5, lines 18-20). Also, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the layer thickness of the epoxy type adhesive agent is 5 to 10 μm , since it has been held that it

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is not inventive to discovering and optimum value or workable ranges by routine experimentation. *In re Aller*, 105 USPQ 233 (CCPA 1955).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ting et al. (US 3,748,439) discloses a thermally conductive adhesive where "In order to improve heat transfer from element 12 to the first heat sink plate 14 it is preferred to attach the element by using a thin layer 22 of electrically and thermally conductive epoxy such as C-409 of Amicon Corporation, Lexington, Massachusetts, an epoxy having approximately 60 to 70 percent of silver by weight" (Column 3, lines 38-47).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is (571) 272-2810. The examiner can normally be reached on 7am - 330pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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4/27/2005

GM


MANISH S. SHAH
PRIMARY EXAMINER
5/2/05